

## CLAIMS

What is claimed is:

- 1        1.        A method of patterning a recording medium comprising:  
2                selectively thermally coupling said recording medium and a heat source to  
3                alter a chemical composition of said recording medium.
- 1        2.        The method according to claim 1, wherein said chemical composition is  
2                altered according to a predetermined pattern.
- 1        3.        The method according to claim 2, wherein said predetermined pattern  
2                comprises one of concentric circles and parallel tracks.
- 1        4.        The method according to claim 1, wherein altering said chemical  
2                composition causes an altered magnetic order of said recording medium.
- 1        5.        The method according to claim 1, wherein altering said chemical  
2                composition causes an altered dielectric constant of said recording medium.
- 1        6.        The method according to claim 5, wherein altering said dielectric  
2                constant causes an altered reflectivity of said recording medium.
- 1        7.        The method according to claim 1, wherein altering said chemical

2 composition causes an altered electrical conductivity of said recording medium.

1 8. The method according to claim 7, wherein altering said electrical  
2 conductivity causes an altered electron transport property of said recording  
3 medium.

1 9. The method according to claim 1, wherein altering said chemical  
2 composition causes an altered thermal conductivity of said recording medium.

1 10. The method according to claim 1, further comprising:  
2 depositing said recording medium on a substrate.

1 11. The method according to claim 1, wherein said selectively thermally  
2 coupling comprises selectively directing an incident thermal wave from said heat  
3 source to said recording medium to form a direct thermal coupling between said  
4 heat source and said recording medium.

1 12. The method according to claim 1, wherein said medium comprises cobalt  
2 and chromium.

1 13. The method according to claim 1, wherein said substrate comprises one of  
2 glass, silicon, quartz, sapphire, AlMg and a ceramic substrate.

1        14.     The method according to claim 1, wherein said heat source comprises one  
2        of a near-field thermal probe and a nanoheater.

1        15.     The method according to claim 1, wherein said heat source physically  
2        contacts said recording medium.

1        16.     The method according to claim 1, wherein said heat source is physically  
2        separated from said recording medium.

1        17.     The method according to claim 1, wherein said chemical composition is  
2        altered by one of interfacial mixing, interfacial reactions, selective oxidation,  
3        structural relaxation, phase segregation and phase change.

1        18.     The method according to claim 1, wherein altering said chemical  
2        composition transforms said medium from a paramagnetic medium to a  
3        ferromagnetic medium.

1        19.     The method according to claim 1, wherein altering said chemical  
2        composition transforms said medium from a ferromagnetic medium to a  
3        paramagnetic medium.

1        20.    The method according to claim 1, wherein altering said chemical  
2        composition alters a magnetic axis orientation of said medium.

1        21.    The method according to claim 1, wherein altering said chemical  
2        composition reduces at least one of magnetization and coercivity of said medium.

1        22.    The method according to claim 1, wherein said selectively thermally  
2        coupling comprises selective near-field radiative coupling of blackbody radiation  
3        from said heat source to said recording medium.

1        23.    The method according to claim 1, wherein said medium comprises  
2         $\text{Co}_x\text{Cr}_{1-x}$ , where x is in a range from 0.63 to 0.75.

1        24.    The method according to claim 1, wherein thermal energy is transferred  
2        to said medium by conductive heating.

1        25.    The method according to claim 1, wherein thermal energy is transferred  
2        to said medium by radiative heating.

1        26.    An apparatus for patterning a recording medium, comprising:  
2                a heat source for generating and directing an incident thermal wave to a  
3        recording medium, said thermal wave altering a chemical composition of a

4 recording medium; and

5 a controller for coordinating a mutual position of said incident thermal  
6 wave and said recording medium so as to thermally couple said heat source and  
7 said recording medium.

1 27. The apparatus according to claim 26, wherein said heat source comprises:  
2 a heating plate for developing a thermal energy field which couples said  
3 heat source to said recording medium; and  
4 a heat sink connected to said heating plate.

1 28. The apparatus according to claim 27, wherein said heating plate comprises  
2 a tip for concentrating and directing a thermal energy.

1 29. The apparatus according to claim 27, further comprising:  
2 an optical waveguide coupled to said heat sink, for carrying a focused laser  
3 beam.

1 30. The apparatus according to claim 29, wherein said optical waveguide  
2 comprises an optical fiber.

1 31. The apparatus according to claim 29, wherein said optical waveguide  
2 comprises a planar optical waveguide.

1        32.    The apparatus according to claim 27, further comprising:  
2                a resistive heating element thermally coupled to said heat sink.

1        33.    The apparatus according to claim 26, wherein said heat source comprises  
2                an atomic force microscope probe.

1        34.    The apparatus according to claim 26, wherein said heat source comprises  
2                one of a nanoheater and a near-field thermal probe.

1        35.    The apparatus according to claim 26, wherein said controller coordinates  
2                said mutual position of said incident thermal wave and said recording medium to  
3                induce a direct thermal coupling that subsumes at least one portion of a thermal  
4                near-field.

1        36.    A read/write head assembly, comprising:  
2                a read/write head:  
3                a heat source connected to said read/write head for generating and  
4                directing an incident thermal wave to a recording medium, said thermal wave  
5                altering a chemical composition of a recording medium; and  
6                a controller for coordinating a mutual position of said incident thermal  
7                wave and said recording medium so as to thermally couple said heat source and  
8                said recording medium.

1        37.     The read/write head assembly according to claim 36, wherein heat source  
2        comprises one of a nanoheater and a near field thermal probe.

1        38.     The read/write head assembly according to claim 36, wherein said  
2        chemical composition is altered according to a predetermined pattern, and wherein  
3        said heat source patterns said recording medium during a read/write operation of  
4        said read/write head assembly.

1        39.     A patterned recording medium, comprising:  
2                a substrate; and  
3                a single layer medium formed on said substrate having a portion which has  
4        been patterned by altering a chemical composition of said medium using selective  
5        thermal coupling.

1        40.     A method for manufacturing a patterned magnetic disk, comprising:  
2                depositing a recording medium on a substrate;  
3                selectively thermally coupling said recording medium and a heat source so  
4        as to alter a chemical composition of said recording medium, and  
5                depositing a protective coating on said recording medium.

1        41.     A programmable storage medium tangibly embodying a program of  
2        machine-readable instructions executable by a digital processing apparatus to

- 3 perform a method for patterning a recording medium, said method comprising:
- 4       selectively thermally coupling said recording medium and a heat source to
- 5       alter a chemical composition of said recording medium.